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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/757,559	01/09/2001	Bruce Tredinnick	M-9506 US	9694

7590

02/27/2002

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EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

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DATE MAILED: 02/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

MF-4

Office Action Summary

Application No.

09/757,559

Applicant(s)

TREDINNICK, BRUCE

Examiner

Kin-Chan Chen

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☒ Claim(s) 2-13 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other:

DETAILED ACTION

Claim Objections

1. Claims 2-13 are objected to because of the following informalities:

In claims 2-13, line 1, "a composition" is improper. The examiner suggests replacing "a" with --the--.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 2, 5-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grumbine et al. (US 5,980,775) in view of Farkas et al. (US 5,773,364).

Grumbine teaches a composition for the chemical mechanical polishing (so-called planarization in the claimed invention) of tungsten (col.4, lines 18-20). A composition may comprise an abrasive such as alumina or silica (col. 6, lines 55-59). An abrasive slurry may comprise an abrasive such as alumina or silica (col. 6, lines 55-59) in deionized water (col. 7, line 57; col. 8, line 63), periodic acid (col. 5, line 11), and inorganic acid (col. 7, line 66), which reads on "a mineral acid" of the claimed invention.

Unlike the claimed invention, Grumbine does not teach that ammonium nitrate may be included in the slurry composition. In a method for using ammonium nitrate for metal CMP, Farkas teaches that ammonium nitrate may be used for polishing conductive layer made of refractory metals (e.g., tungsten) because ammonium nitrate does not contaminate integrate circuit surfaces and stain equipment, is easy to distribute and dispose from integrated circuit facility, and environmentally safe. (col. 3, lines 7-10; col. 3, lines 42-50). Ammonium nitrate can be used in a broad pH range and can be easily adjusted by the addition of nitric acid. Hence, it would have been obvious to one with ordinary skill in the art to modify Grumbine by including ammonium nitrate in the polishing composition for tungsten CMP as taught by Farkas in order to not contaminate integrate circuit surfaces and stain equipment, easy to distribute and dispose from integrated circuit facility, and to be environmentally safe.

The instant claim differs from the prior art by specifying that a mineral acid may be used in such quantity as to prevent the precipitation of salts of iodic acid. However, it is well known in the science to use suitable amount of mineral acid for adjusting the pH of the solution to prevent the precipitation of the salt in order to maintain homogeneous phase for better contact.

As to dependent claim 2, Grumbine teaches that abrasive may be alumina (col. 6, lines 40-43).

As to dependent claim 5, Grumbine teaches that alumina may be about 1.0 to 20.0 wt% (col. 6, lines 44-46), which encompass the claimed range.

As to dependent claim 6, Grumbine teaches that abrasive slurry may be a silica slurry (col. 6, lines 43-45).

As to dependent claim 7, Grumbine teaches that the silica in the silica slurry may be preferably from about 1.0 to about 20 wt % (col. 6, lines 43-45). The instant claim differs from Grumbine by specifying 0.1% to 0.5% silicon dioxide in the silica slurry. However, the loading level of abrasive in the CMP slurry is depending on the specific product and quality requirement and known to be a result-effective variable, it would have been obvious to one of ordinary skilled in the art to modify Grumbine by using the suitable amount of loading level of abrasive through routine experimentation in order to meet product and quality requirement.

As to dependent claim 8, Grumbine teaches that periodic acid may be 0.5 to 10.0 wt % (col. 5, lines 42-43), which encompass the claimed range.

As to dependent claim 9, Farkas teaches that ammonium nitrate may be used as oxidizing / etching species in the slurry for polishing conductive layer made of refractory metals (e.g., tungsten) (col. 3, lines 7-10; col. 3, lines 42-50). Farkas does not disclose the percent weight of ammonium nitrate used in the composition. The instant claim differs from Farkas by specifying 0.1% to 2% by weight of ammonium nitrate in the slurry. However, wt% of ammonium nitrate in the slurry is known to be result-effective variable, it would have been obvious to one of ordinary skilled in the art to determine the suitable wt% of ammonium nitrate in the slurry through routine experimentation in Farkas in order to provide their art recognized advantages and produce an expected result. Hence, it would have been obvious to one with ordinary skill in the art to modify

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Grumbine by including ammonium nitrate in the polishing composition for tungsten CMP as taught by Farkas in order to not contaminate integrated circuit surfaces and stain equipment, easy to distribute and dispose from integrated circuit facility, and to be environmentally safe.

As to dependent claims 10 and 11, Grumbine teaches that inorganic acid may be used (col.7, line 66). Grumbine is not particular about the inorganic acid used in his composition. Hence, it would have been obvious to one with ordinary skill in the art to use nitric acid because it is one of the most popular inorganic acid in the art of semiconductor device fabrication. Furthermore, Farkas teaches that nitric acid (col. 4, line 29) may be used in the slurry containing ammonium nitrate in order to easily adjust the pH of the slurry. Hence, it would have been obvious to one with ordinary skill in the art to use nitric acid as taught by Farkas in Grumbine's process in order to easily adjust the pH of the slurry. The instant claim 11 differs from the prior art by specifying 0.2% by weight of nitric acid. However, same is known to be result-effective variable, it would have been obvious to one of ordinary skilled in the art to determine the suitable wt% of nitric acid through routine experimentation in the combined prior art in order to produce an expected result.

As to dependent claims 12 and 13, Grumbine teaches that the pH of the slurry may be adjusted away from the isoelectric point to maximize colloidal stability and maintain good dispersion (col. 7, lines 58-63). Grumbine and Farkas do not specify the pH range used in the process. The instant claims differ from Grumbine and Farkas by specifying the pH range of the composition (such as 3 to 4.5 in claim12, 3.8 to 4.2 in

claim13). However, it is known to be result-effective variable, it would have been obvious to one of ordinary skilled in the art to determine through routine experimentation the optimum, operable range in the combined prior art in order to maximize colloidal stability and maintain good dispersion.

4. Claims 3 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grumbine et al. (US 5,980,775) and Farkas et al. (US 5,773,364) as applied to claims 1 and 2 above, and further in view of Obeng (US 5,735,963).

The discussion of modified Grumbine and Farkas from above is repeated here.


Unlike the claimed invention, Grumbine and Farkas do not explicitly state that alumina may be other than alpha alumina, such as gamma alumina for the CMP of tungsten. However, it is well-known feature that using gamma alumina for the CMP of tungsten. Obeng is relied on only to show this well-known feature. Obeng teaches that gamma alumina may be used for CMP of tungsten (see abstract). Hence, it would be obvious to one skilled in the art to modify Grumbine and Farkas by using gamma alumina as taught by Obeng in order to provide their art recognized advantages and thus produce an expected result.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (703) 305-0222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone

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numbers for the organization where this application or proceeding is assigned are (703) 305-5408 for regular communications and (703) 872-9311 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2934.

K-C C
February 20, 2002


Patent Examiner
Group Art Unit 1765